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ABSTRACT

Severe weather is an element of nature that cannot be controlled. Therefore, it is important that the general public be aware of severe weather and know how to react quickly and appropriately in a weather emergency. This study, done in the community surrounding the Southern Illinois University at Carbondale, was conducted to compile and analyze data on public perceptions in a severe weather situation. The specific objective was to identify specific problem areas concerning safety education and some of the confusion about basic terminology. The study suggests that there exist not only some confusion over the terminology of "watch" and "warning," but also some education may be necessary for public safety. The results indicate a need for further study in the area of weather perceptions, as well as an increased emphasis on the development of educational programs that would be aimed at improving the understanding among members of the public. The appendix includes the survey instrument used in the study. (TW)

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SEVERE WEATHER PERCEPTIONS

By

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October 1987

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CHAPTER 1

INTRODUCTION

Importance of the Topic

Severe weather is an element of nature that cannot be controlled. It is extremely important that the general public be aware of severe weather and know how to react quickly and appropriately in a weather emergency. In an effort to meet these needs, a national network for severe weather prediction and the issuance of warnings has been instituted which spans federal, state, and local levels. A system for the dissemination of weather emergency information has been carefully constructed and the rapid distribution of such information is central to the mission of media and weather professionals throughout the nation.

The severe weather network originates at the National Meteorological Center at Camp Springs, MD (Brown and Fawcett, 1972; Fawcett, 1977). The forecasts produced there are applicable for several days and are intended to aid other forecasters prepare regional and local weather forecasts. Maps are distributed to the National Severe Storms Forecast Center (NSSFC) at Kansas City, MO, and to National Weather Service Forecast Offices (WSFO's) across the country. (Pearson, 1981).

The Severe Local Storms (SELS) Unit of the NSSFC has the primary responsibility of providing around-the-clock surveillance and forecasting of severe thunderstorms. (Pearson, 1981). It is the responsibility of this unit to issue severe thunderstorm and tornado watches. From this point, different agencies within the network share different responsibilities. Local forecasts and

warnings are generated by a NWSFO for specific areas. The office responsible for any given area will monitor weather conditions and issue severe advisories as necessary. Severe weather can develop quickly, and, in order to insure the safety of the general public, procedures, safety precautions, and rules for appropriate action need to be pre-designated so that critical time is not lost in an actual weather emergency. An elaborate system has been developed to provide for the identification, dissemination, and instruction of such procedures and actions in an effort to provide for the safety of the public. This system, however, depends on the publics accurate interpretation of standard weather emergency warning phraseology in order to ensure rapid and appropriate action by the general public. The system also assumes that the public has become knowledgeable concerning safety rules and appropriate actions to be taken in a diversity of weather emergency situations. Because of the extensive education efforts of the government, it is generally assumed by media and weather professionals that the public has a clear understanding of impending weather situations, a clear understanding of weather information and warning phraseology, and knowledge of pertinent safety rules and appropriate actions in weather emergency situations.

Severe weather is a life-threatening environment and, to provide for public safety, it is the systems responsibility to insure that the public is adequately educated and informed. To meet its obligations to public safety, the system should make every effort to identify any areas of deficiency in its educational or informational services. In order for the system

to function optimally, it is essential that warning terminology is clear and accurately interpreted and that education concerning safety rules and appropriate action is adequate. The identification of any confusion in public perceptions of warnings and/or rules or actions is vital to understanding how the public may react in these emergency situations.

Statement of the Problem

It was the concerns of this researcher and others that there may exist some level of confusion on the part of the public with regards to the use of the terminology "watch" and "warning" in the differentiation of the level of severity between severe weather phenomena. In addition, there was a concern that some terminology used on a day-to-day basis by weather and media professionals pertaining to hazardous weather may not convey a clear understanding to members of the public when used in public safety announcements. It has been the researchers experience that some members of the public inaccurately interpret the use of such terms as "hook echo" and "funnel cloud" when they are used in such announcements. Whereas a professional meteorologist may understand implicitly the meaning of such words, a member of the general populous may be confused as to the exact meaning of the word which could result in inappropriate action on the part of that person.

One of the stated goals of the National Weather Service (NWS) is to help initiate appropriate adaptive responses. (Pifer and Mogil, 1978). For these responses to be adequate, the general public must be reached and educated as to the specific

safety rules and appropriate action in the event of specific weather emergencies. The researcher has, in the past, experienced several cases of misunderstanding concerning safety rules and appropriate action on the part of members of the public. For this reason, the researcher had some concerns that there may exist an inordinate lack of education of the public despite the extensive educational efforts of the system.

Background of the Study

At the 1986 annual meeting of the National Weather Association (NWA), a discussion of the watch/warning confusion ensued between several of the participants. There have been a few previous studies concerning this confusion (Pifer and Mogil, 1978; Murphy and Brown, 1983) but there remained among the participants some concerns about the problem. While these studies have suggested there is confusion between these terms, the studies were less that definitive and their researchers indicated that further study was necessary. In an effort to ascertain the level of confusion among their media audience, two NWA members, Kerry Dean Teverbaugh and Thomas Stephens, surveyed 2061 Midwest television viewers and established that there was a need to further study concerning the confused perceptions of the public. By polling these people, Teverbaugh and Stephens have demonstrated the existence of a general level of confusion among viewers but the definition of the specific nature and level of misunderstanding was not definitively established.

Research Methodology

A survey instrument was prepared by the researcher which contained questions designed to collect data concerning the respondent's opinions and perceptions on severe weather terminology and their understanding of safety rules and appropriate actions during severe weather conditions. Data collected through the instrument were compiled and analyzed according to a descriptive research model format in an effort to identify any possible confusion with the specific terminology "watch/warning" and any misconceptions about safety rules and actions.

The survey instrument was specifically designed to determine priorities that the respondent's would set in severe weather and to what degree the media affected personal decision. By asking reaction questions, the survey instrument was structured to identify any problems in the general education of the public concerning safety procedures. Data analysis of survey results was designed to identify problem areas in public education with regards to topics of public safety.

The population surveyed consisted of a cross-section of predominantly rural and urban Midwesterners. The sample population was a sample of convenience taken in the Southern Illinois area and consisted of sub-populations of University classes, grade school classes, civic organizations, and professional organizations of that region. The inclusion of members of the University student community enabled the researcher to survey a greater diversity of demographic backgrounds which contributed to a more representative population

sample. Respondents were also asked to respond to a set of demographic descriptors so that a correlational analysis using statistical methods would be possible at a later date should future research wish to explore the possibility of response variance due to sub-group membership. This would enable future research to utilize the data to determine the possible between group variation in understanding controlling for such factors as age, education, community size and gender.

Significance of the Study

The results of this study provided definitive data concerning public perceptions of weather warning terminology and their understanding of safety rules and appropriate actions during severe weather conditions. Such data was needed to evaluate the current state of public safety with regards to weather related emergencies and to help answer the questions concerning the level of confusion among the public concerning weather terminology. While previous studies established that some confusion existed, this study sought to elaborate on the various areas of confusion and identify specific problem areas in public perceptions and understandings.

A significant and unique aspect of this study was that it combined both terminology perception and public awareness towards safety procedures. By combining both of these aspects of the weather emergency problem, a greater awareness can be realized concerning a holistic understanding of the level of public safety in severe weather conditions. Conclusions from the study should help weather and media professionals identify areas of necessary

education and possible terminology changes necessary to ensure greater public safety.

Research Questions

The present study was conducted to compile and analyze data on public perceptions in a severe weather situation. The specific objective was to identify specific problem areas concerning safety education and confusion on basic terminology. The study was designed to pinpoint answers to the following research questions:

1. What are the perceptions of the public listener to various National Weather Service Advisories during severe weather conditions?

2. Does current Weather Warning wording elicit confusion among a large segment of the general population and does this confusion have the potential to cause inappropriate behavior among individuals in a sever weather situation?

3. Is there a need for public education on severe weather safety rules?

4. What sources of information does the public utilize most during severe weather conditions?

Limitations of the Study

The questions associated with public perception of terminology and safety measures in hazardous situations are very complex and vast in scope. It was necessary, therefore, to limit the study to severe springtime weather phenomena in order to make the research manageable. While the researcher recognized the dangers associated with winter storm phenomena, the author felt that this topic should be addressed in a different study. Surveys by Teverbaugh and Stephens established the need for this study by identifying significant levels of confusion among their

viewer respondents. While this study sought to expound on their findings by further defining specific problems in the area of public weather safety, this study can not be viewed as comprehensive in its scope. It is necessary to remember that one study cannot narrow down all problem areas, or adjust for possible solutions within the system.

The researcher wishes to also appraise the reader of a possible problem area in the survey instrument, which the author realized after disseminating the instrument, which could have conceivably biased one of the question's results. The researcher feels that the question concerning the severe thunderstorm watch (question number two) may lead the respondents to the correct answer. It is the researchers suggested that this question's results be held suspect and that future studies consider more careful wording of similar questions.

Summary

The following research report begins with a discussion of the research methodology and specific sample groups surveyed. This section is followed by a synopsis of the results of the survey with a description of the author's interpretation of the data. The survey results provide insight into the problems associated with weather perceptions and suggest answers to the research questions. The last section includes a discussion of recommendations from the researcher concerning the implications of the findings. This will include recommendations concerning the need for further study on the subject.

CHAPTER 2

THE RESEARCH STUDY

Methodology of the Study

The survey instrument was designed by using various suggestions from a diversity of sources including National Weather Service definitions, various broadcast media input, and general public concerns. Several comments on the previous surveys by Teverbaugh and Stephens indicated that the general public felt there was some confusion over the use of the phraseology "watch and warning." The Terre Haute, IN broadcasting area responded with 71% of the populace surveyed feeling that there was a confusion over the term "watch." The Flint, MI area responded with a 53% agreement on the confusion.

After considering the previous survey formats, the researcher constructed a survey instrument with the intended purpose of specifically identify where the confusion exists and the pervasiveness of those misunderstandings. In particular, the researcher hoped to delineate how the general public perceives the relative severity of the terminology "watch" and "warning". Other specific areas of safety related information and procedures were also defined.

A sample of convenience was utilized in that area residence of the Southern Illinois communities of Carbondale and its surrounding area as well as members of the student population at Southern Illinois University were poled. The respondents represented members of rural and urban populations all of whom were Midwesterners. The use of a sample of convenience was

necessitated by the lack of funding necessary to facilitate a demographic cross-sectional study at numerous locations. It was the researchers feelings that this sample did, however, meet the criteria of a reasonably representative sample population since the University student body is composed of a wide diversity of demographic profiles.

Sample groups included persons of all ages and educational backgrounds and the researcher took great pains to insure that a diversity of socio-economic populations was represented. The survey also included media people and various representatives of the aviation community. It is the researcher belief that a very representative cross section of the population was represented in this research.

A demographic profile was included as a part of the survey in order to establish the representativeness of the sample and for future use in determining within and among group statistical correlations. At this time the demographic results have only be tabulated with respect total numbers of representatives in each demographic descriptor. The researcher hopes to use these demographic descriptors in the future to provide a better view of specific problem areas of each population.

The questions concerning terminology were set up using Weather Service Definitions as given to Severe Weather Spotters. Each question included several choices to define a word. The correct choice was included along with at least one choice that could be construed as a prominent misconception. The survey also included a question concerning the National Weather Service NOAA Weather Radio system. It was the opinion of the researcher,

based on personal experiences, that the public has little knowledge of this valuable resource. The researcher sought to determine if this perception was correct.

Included in the survey was a question asking the respondents to rank, according to their understanding, the severity of different weather warnings. This was to determine if the public focused on words such as "tornado" instead of "warning", or "severe" rather than "watch, warning, or risk".

Respondents were also asked to rank the media from which they derived the majority of their information concerning severe weather conditions. It was felt that this would give insight as where weather information could be most effectively presented and what further education may be necessary for professionals in an effort to provide better service to meet public needs.

Summary

Through the use of the survey instrument, the researcher was able to compiled informational data base concerning public perceptions and knowledge concerning important weather terminology and procedures. The results of the survey are presented in descriptive format as means for the generalized population surveyed.

CHAPTER 3

RESEARCH FINDINGS

Introduction

The results of the study centered around the percentage of respondents picking particular choices when asked to indicate their understanding of severe weather terminology and safety rules. Each question was reported according to the percentage of respondents answering with the correct response and the percentage of replies for each of the incorrect statements. Following the presentation of raw data, a summary was included to generalize the publics awareness and to define significant factors which contributed to the public's perception of severe weather conditions.

Graphs were constructed to help portray the results in a more perceptible fashion. The charts make a determination of the portion of the public answering the question correctly more evident by coloring the representative bar with a solid color. All other responses are cross-hatched for contrast. In turn, the response for questions requiring ranking were presented as a mean for the population. In interpreting this graph, the reader must remember that the bar with the least height represents the response ranked as most favored. These graphs are included in the Appendix of this document along with a sample survey instrument. The size of the sample population was 2,651 respondents (N = 2,651).

Survey Results

In the first questions, respondents were asked to define the term "funnel cloud". 32 percent of the respondents chose the most correct answer "a triangular shaped cloud that extends from a towering cumulus or thunderstorm base". The remaining 68 percent chose from the other three answers. Most of the respondents (50 %) chose the response "a violently rotating column of air in contact with the ground and doing damage". Seven percent chose "a transition zone between two differing airmasses; while the remaining eleven percent chose "round protuberances or pouches on the under surface of a cloud".

When asked to define a severe thunderstorm watch, an overwhelming number chose the most correct answer, " weather conditions are favorable to help severe thunderstorms to develop" (92%). The remaining eight percent were divided almost evenly among; a tornado has been sighted, seek shelter (3 percent), a cold front is moving in and likely to form a squall line (2 percent), and "you should move to the lowest level of your house and wait for an all clear".

The definition of a "squall line" produced the most correct response with 42 percent of the respondents choosing "any narrow band or line of thunderstorms". The remaining 58 percent responded with; "a line of cumulus connected to and extending outward from the parent thunderstorm", (17%), "a gust front out ahead of the thunderstorms where high winds are possible", (27%), and "a visible column of rain or hail falling from a cloud base", (15%).

The respondents overwhelmingly chose "your local National

Weather Service Office" for who issues a severe thunderstorm watch (74%). The most correct answer, "the National Severe Storms Forecast Center at Kansas City, MO", received only a 20 percent response. The other six percent was divided among, "your local law enforcement agency", (1%), and the National Severe Storms Laboratory in Norman, OK", (5%).

To judge public action in an emergency weather situation, the respondents were asked how they would respond if they resided in a mobile home and a tornado was sighted. 56 percent of the respondents replied that they would seek shelter somewhere inside of the mobile home, a possibly fatal choice; while only 44 percent said that they would leave and seek shelter elsewhere. The 56 percent was broken up as follows; "go into an interior bathroom, squat and cover my head", (25%), "open my windows and move into a hallway", (24%), and "go to a southwest corner immediately" (7%).

Four definitions were given for the term "hook echo" which is often used in weather information bulletins. The respondents chose the most correct answer "a radar pattern sometimes observed in the southwest quadrant of a tornadic thunderstorm", 50 percent of the time. The remaining 50 percent was divided among; " a comma shaped cloud, generally connected to a mature thunderstorm at the northeast baseline" (26%), "a funnel shaped cloud extending from the base of a mature thunderstorm" (15%), and "a local and often abrupt lowering of a rain-free base" (9%).

When asked how they would respond to the issuance of a tornado watch, 51 percent of the respondents chose the most right answer, "continue normal activities, but keep updated on the

weather". The remaining respondents were split among "call my friends and let them know" (7%), "seek shelter immediately" (40%), and "call my local law enforcement agency for more information" (3%).

To test public understanding of when the heaviest part of the thunderstorm is moving in, they were given four choices. These choices consisted of: "the temperature cools off some", "the rain stops", "the sky turns a "greenish" color", and "hail is falling." The most correct answer of the choices is when "hail is falling" and this was chosen by 40 percent of the respondents. The other three choices were divided with; 26 percent choosing, "the temperature cools off some", 28 percent choosing, "the sky turns a "greenish color", and six percent choosing "when the rain stops".

Another common thunderstorm threat is flash flooding. The respondents were asked to define the term and 65 percent of those polled chose the most correct response, "flooding that develops quickly on streams and tributaries, usually as a result of thunderstorms". Out of the 35 percent remaining, 18 percent chose "street flooding of less than 3 inches of rain", 13 percent chose "flooding of low lying areas that results over an extended period of time", and the remaining four percent chose "flooding that results from spring snow melt and is forecast for a long duration".

To test the public's perception of how to react when they are in a car and a tornado is sighted, they were given four choices. 64 percent of the respondents chose the most correct answer, "leave the car and seek shelter in the lowest area

outside". The remaining 36 percent chose answers indicating that they would remain in the car. They were broken down as follows: 16 percent would "remain in the car, squat and cover my head", 14 percent would "drive at 45 degree angles away from the storm", and 6 percent would "drive as fast as I can to the nearest community shelter."

When asked to define a severe thunderstorm warning, 47 percent of the respondents chose the most correct answer, "a severe thunderstorm is moving into your area, seek shelter". The remaining answers were broken down as follows: "weather conditions are favorable to produce severe weather in your area" (27%), "I should go about my normal duties but keep updated on the weather situation" (18%), and "winds of 30 mph have been reported in the thunderstorm" (9%).

The respondents were then asked to evaluate their emergency plans during a tornado situation. When asked what to do during a tornado, 54 percent of the respondents chose the most correct answer, "go immediately to a safe place". The remaining respondents would go about other activities before seeking shelter. They chose: "open some windows to relieve pressure" (38%), "call friends and relatives to warn them" (6%), and go out to look to see which way it is moving" (1%).

To determine public knowledge of the NOAA Weather Radio Network, the respondents were asked to define the term. Only 42 percent of the respondents chose the most correct answer, "a specially-designated group of frequencies, manned by the National Weather Service, and providing 24-hour a day weather information". The other 58 percent were divided among; "frequent

weather updates, supplied by the National Weather Service, to your local radio media" (35%), "state police frequencies set aside for weather information" (13%), and a programmable scanner used by Skywarn agencies to keep updated on weather information" (10%).

The last multiple choice question was structured to determine public awareness of who provided for local warnings in weather emergencies. When asked who was responsible for the local sirens, and overwhelming number chose the most correct response, "your local Emergency Services and Disaster Agency" (71%). The remaining respondents chose: "your local National Weather Service Office" (24%), "your local radio station" (5%), and "your local television station" (1%).

To determine public perception of terminology, respondents were asked to rank in order of severity the common weather information terms; severe thunderstorm warning, tornado watch, severe thunderstorm watch, a moderate risk of severe thunderstorms, and tornado warning. The most correct ranking would be:

1. Tornado warning
2. Severe thunderstorm warning
3. Tornado watch
4. Severe thunderstorm watch
5. Moderate risk of severe thunderstorms.

The mean ranking by the respondents was:

1. Tornado warning (average 1.00)
2. Tornado watch (average 2.42)

3. Severe thunderstorm warning (average 2.51)

4. Severe thunderstorm watch (average 3.99)

5. Moderate risk of severe thunderstorms (average 4.98).

In order to determine how the majority of the public obtains information on severe weather conditions, the respondents were then asked to rank the media that they used most often to obtain weather information. There is no set "most correct" answer in this question. The point of the question was to determine what media the public uses most during a severe weather emergency. The order that the respondents chose was:

1. Radio (average 1.28)

2. Television (average 1.39)

3. Local ESDA (average 3.6)

4. Newspaper (average 4.12)

5. NOAA weather radio (4.70)

It was devastating to the researcher to find that the public chose the "newspaper" as ranking higher when seeking current, accurate severe weather information than the very effective NOAA weather radio system. This fact highlights the gross lack of awareness on the part of the public concerning this valuable weather information resource.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

Summary of the Research Findings

The survey instrument set out to answer the following questions:

1. What are the perceptions of the public listener to various National Weather Service Warnings during severe weather conditions?

2. Does current Weather Warning wording elicit confusion among a large segment of the general population and does this confusion have the potential to cause inappropriate behavior among individuals in severe weather situations?

3. Is there a need for public education on severe weather safety rules?

Addressing each question; it seems apparent that perceptions among the public concerning severe weather are confused by the terminology "watch" and "warning". The respondents seemed more likely to key on the words "tornado" or "severe thunderstorm" over the terminology of "watch" and "warning". The studies by Teverbaugh and Stephens indicate from public comments that the confusion may lie in the similarity of the words. Both words begin with a "wa" and can sound similar when broadcast. Other terminology that seems confusing is the use of common weather definitions and terms. The public seems to have a lack of understanding that a tornado is on the ground while a funnel cloud is aloft.

In response to the second research question, it seems that some change may be needed in terminology. If "watch" and "warning" are confusing, then the general message for public safety is not being correctly perceived and inappropriate actions

may be the result.

It seems apparent from the findings that there is a definite need, not only for public education on safety rules, but on public avenues for accurate and timely weather information. The public still lacks understanding concerning the actual steps to take in an emergency situation. It also appears that the majority of people are unaware of the invaluable resource for weather information available to them through the NOAA Weather Radio network.

It is important to remember that reaction time in an emergency must be rapid, time may not allow for steps other than to seek shelter. Rapid and correct action depends on an accurate perception of the weather information and a good working knowledge of appropriate actions in the event of a weather emergency. This is an area where lives are at stake, and if adequate information is not available, perceptions not accurate, and actions are inappropriate to the situation, death tolls in a severe storm could be drastically increased.

General Conclusions

The research strongly suggests that there exist not only some confusion over the terminology of "watch" and "warning", but also some areas where education may be necessary for public safety. When considering the question of terminology, the research indicates that there is a measurable deficiency among members of the public to correctly interpret commonly used severe weather terminology. It is disturbing that only 32 percent of the respondents understood the meaning of the term "funnel cloud"

when this term is commonly used in weather warnings. Although 50 percent of the respondents chose the correct definition for a tornado, the remaining 50% did not have a clear definition and, when the two questions are considered jointly, there appears to be some confusion between the terms "funnel cloud" and "tornado". When asked to define "squall line", the respondents did choose the correct answer 42 percent of the time, the other 58 percent were divided among their choices. The use of the word squall line is popular among public media, however there seems to be a misconception about what it actually means.

The word "hook echo" is not quite as frequently used, but it is mentioned in times of severe weather. 50 percent of the respondents choice the correct definition, possibly keying on the word "radar". The other 50 percent actually chose a cloud definition, i.e.; they assumed it was an actual weather phenomena that you can visually see.

The 65 percent response to the definition of the word "flash flooding" may have been because the respondents keyed on the words "quickly" and "thunderstorms" or that, hopefully, there exists a greater understanding of the actual meaning of the term. The remaining respondents seem to split among the other choices.

When asked to define NOAA Weather Radio, the researcher feels that it is significant that only 42 percent of the respondents chose the correct answer. 35 percent to the remaining populace surveyed chose incorrect answers and could have possibly been selecting answers by keying on the words "local radio media" instead of "National Weather Service". In turn, when ranking the medium used for information, weather radio

was ranked last after newspapers. This implies a lack of understanding that NOAA Weather Radio provides an invaluable resource for current weather information.

The researcher felt that it was very positive that 71 percent of the respondents knew that the local warning network, "sirens", were manned locally be the Emergency Services and Disaster Agencies. This implies that, at least on a local level, there is some understanding of the emergency network.

This data is clear evidence that confusion exists among members of the public concerning frequently used severe weather terminology. It is also evident that the confusion exists in both the terminology used by the National Weather Service and the general media alike.

When considering safety options in an actual weather emergency, it seems apparent that there is confusion over what steps to follow. 44 percent of the respondents would leave a mobile home during a tornado, while a significant 56 percent would seek shelter somewhere in that mobile home. It appears that the respondents may have keyed on wording such as; "interior bathroom", "hallway", and "southwest corner" which are terms used in association with seeking shelter in a secure structure. This confusion could prove fatal. A similar confusion seems to exist concerning appropriate action while in a car. While 64 percent did choose to leave the automobile, another 36 percent would seek shelter, while still in the car, or try to outrun the storm.

One of the most common safety rules governing action while in a building during a tornado seems to be unclear to about half of the population. It appears that only 54 percent of the

respondents would seek shelter first during an actual emergency, while the remaining 46 percent would use valuable time to go about other activities. Out of this 46 percent, it seems significant that 38 percent chose the myth of "open windows to relieve pressure." Because the respondents were in all age categories, it appears that there is still a hold-over from past training. Certainly education needs to be expanded in this area.

Considering the terminology "watch/warning", a few questions were geared to check the common opinion of the correct terminology. The first question dealt with a severe thunderstorm watch. Although 93 percent of the respondents chose the correct answer, it is the opinion of the researcher that this question needs to be re-evaluated. The first answer, "a tornado has been sighted, seek shelter", may have lead respondents and the question would probably have tested the public opinion better if it had been worded " a severe thunderstorm has been sighted, seek shelter". The researcher feels that the respondents most likely used a process of elimination to narrow down the choices to obtain this answer.

When asked how they would respond when a tornado watch was issued, only 51 percent of the populace chose the most correct answer "continue normal activities, but keep updated on the weather". It seems very significant that another 40 percent chose "seek shelter immediately", which is the reaction one would expect during a warning situation. It is important to remember that the confusion over this terminology could result in the loss of life.

A more significant result occurred when the respondents were

asked how they would react in a severe thunderstorm warning. Only 47 percent knew that it meant "a severe thunderstorm is moving into your area, seek shelter". The other 53 percent would treat the warning situation like a watch. This implies significant confusion over the terminology and the appropriate action implied by each.

Another situation where confusion arose over the terminology of "watch" and "warning", was when the respondents were asked to rank several situations in order of severity. It is interesting to note that "tornado watch" was ranked above "severe thunderstorm warning". The researcher feels that the respondents may have focused on the word "tornado" as opposed to the difference between "watch" and "warning".

The researcher's last concern dealt with the public's perception as to when a thunderstorm is heaviest. It is interesting to note that most of the respondents were split among the choices. The most correct answer "when hail is falling", did elicit 40 percent of the response. There remains, however, 60 percent of the respondents who do not know how to recognize the heaviest part of the storm.

Recommendations

It is the researcher's opinion that this research indicates the need for further study in the area of severe weather perceptions. A statistical study utilizing a more diverse population would be appropriate with the inclusion of demographic descriptors such as age, education, community size,gender, and geographical considerations. Such a study would allow for the

statistical rendering of the data to ascertain specific levels of understanding for such sub-populations.

The survey instrument necessary for such a study could be of a similar format to the survey instrument used in this study. If such were to be the case, it is the researcher's recommendation that a few of the questions be changed to more adequately judge public response and guard against survey induced bias.

If a more comprehensive study continues to support the hypothesis that the terminology of "watch" and "warning" remains suspect to the precipitation of confusion, then other terminology should be considered. Wording such as those suggested by professionals in the weather and media fields, such as "possibility", "alert", or color-coding; i.e.; "red alert", or "yellow alert" should be carefully evaluated before becoming adopted.

In the area of public education, there seems to be a definite need for greater understanding among members of the public. Southern Illinois University has begun a "Junior Weather Observer" Program for use at the elementary level in an effort to promote greater weather understanding at an early age. If an evaluation of such a program demonstrates its merit, similar programs could be started nation-wide to start severe weather education at a young age.

Other program ideas include certification of broadcasters by the National Weather Association or some other national organization. This would be a training program, concerning severe weather, for members of the broadcast media. It would help insure understanding by the people that the general populace

looks to for accurate information times of severe weather.

In closing, it is the opinion of the researcher that educational programs be instituted on a national level to aid public awareness of severe weather situations. After a more comprehensive research study, these areas could be more specifically defined to allow for optimal weather education. The researcher feels that with proper education and less confusion among severe weather terminology, the general public would be less at risk in an actual severe weather emergency.

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APPENDIX

SEVERE WEATHER SURVEY

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CHOOSING THE BEST CORRECT ANSWER IN YOUR OPINION.

1. A funnel cloud is:

   A. A violently rotating column of air in contact with the ground and doing damage.

   B. A triangular shaped cloud that extends from a towering cumulus or thunderstorm base.

   C. A transition zone between two different airmasses.

   D. Round protuberances or pouches on the under surface of a cloud.

2. A severe thunderstorm watch means:

   A. A tornado has been sighted, seek shelter.

   B. A cold front is moving in and is likely to form a squall line.

   C. Weather conditions are favorable to help severe thunderstorms to develop.

   D. You should move to the lowest level of your house and wait for an all clear.

3. A squall line is:

   A. Any narrow band or line of thunderstorms.

   B. A line of cumulus connected to and extending outward from the parent thunderstorm.

   C. A gust front out ahead of the thunderstorms where high winds are possible.

   D. A visible column of rain of hail falling from a cloud base.

4. A severe thunderstorm watch is issued by:

   A. Your National Weather Service Office.

   B. Your local law enforcement agency.

   C. National Severe Storms Laboratory in Norman, OK.

   D. National Severe Storms Forecast Center at Kansas City, MO.

5. If I am in a mobile home and a tornado has been sighted, I should:

   A. Go to the interior bathroom, squat and cover my head.

   B. Leave and seek shelter elsewhere.

   C. Open my window and move into a hallway.

   D. Go to a southwest corner immediately.

6. A hook echo is:

   A. A comma shaped cloud, generally connected to a mature thunderstorm at the northeast baseline.

   B. A funnel-shaped cloud extending from the base of a mature thunderstorm.

   C. A local and often abrupt lowering of a rain-free base.

   D. A radar pattern sometimes observed in the southwest quadrant of a tornadic thunderstorm.

7. When a Tornado Watch is issused, I should:

   A. Call my friends and let them know.

   B. Continue normal activities, but keep an update on the weather.

   C. Seek shelter immediately.

   D. Call my local law enforcement agency for more information.

8. You know you are in one of the heaviest parts of the thunderstorm, when:

   A. The temperature cools off some.

   B. The rain stops.

   C. The sky turns a "greenish" color.

   D. Hail is falling.

9. Flash flooding is:

   A. Flooding that results from spring snow melt and is forecast over a long duration.

   B. Flooding that develops very quickly on streams and tributaries, usually as a result of thunderstorms.

   C. Flooding of low lying areas that results over an extended period of time.

   D. Street flooding of less than 3" of rain.

10. When I am in a car and a tornado is sighted, I should:

   A. Drive at 45 degree angles away from the storm.

   B. Drive as fast as possible to the nearest community shelter.

   C. Leave the car and seek shelter in the lowest area outside.

   D. Remain in the car, squat and cover my head.

11. A severe thunderstorm warning means:

   A. Weather conditions are favorable to produce severe weather in your area.

   B. Winds of 30 mph have been reported in the thunderstorm.

   C. I should go about my normal activities, but keep updated on the weather situation.

   D. A severe thunderstorm is moving into your area, seek shelter.

12. During a tornado, I should:

   A. Go immediately to a safe place.

   B. Open some windows in the house to relieve pressure.

   C. Call friends and relatives to warn them.

   D. Go out to look to see which way it is moving.

13. NOAA Weather Radio is:

A. Frequent weather updates, supplied by the National Weather Service, to your radio media.

B. A specially designated group of frequencies, manned by the National Weather Service and providing 24 hour a day weather information.

C. State police frequencies specially set aside for weather information.

D. A programmable scanner used by the Skywarn agencies to keep updated on weather information.

14. Your local sirens are manned by:

A. Your local National Weather Service office.

B. Your local radio station.

C. Your local Emergency Services and Disaster Agency.

D. Your local television station.

15. Please rank in order of severity the following severity the following severe weather conditions: (1 being most severe, etc...)

_____severe thunderstorm warning

_____tornado watch

_____severe thunderstorm watch

_____moderate risk of severe thunderstorms

_____tornado warning

16. Please rank the following in the order that you use them to receive weather information: (1 the most often used, etc.)

_____television

_____newspaper

_____local law enforcement agency

_____local ESDA

_____radio

_____weather radio

17. I am:

_____male

_____female

18. My age is :

_____under 12

_____12-18

_____19-24

_____25-30

_____30-40

_____over 40

19. The last grade I completed in school is:

_____elementary school

_____junior high school

_____high school

_____some college

_____college graduate

_____post-graduate studies

20. I live in a town with a population of:

_____100-5000

_____5001-10000

_____10001-20000

_____20001-30000

_____30001- or greater

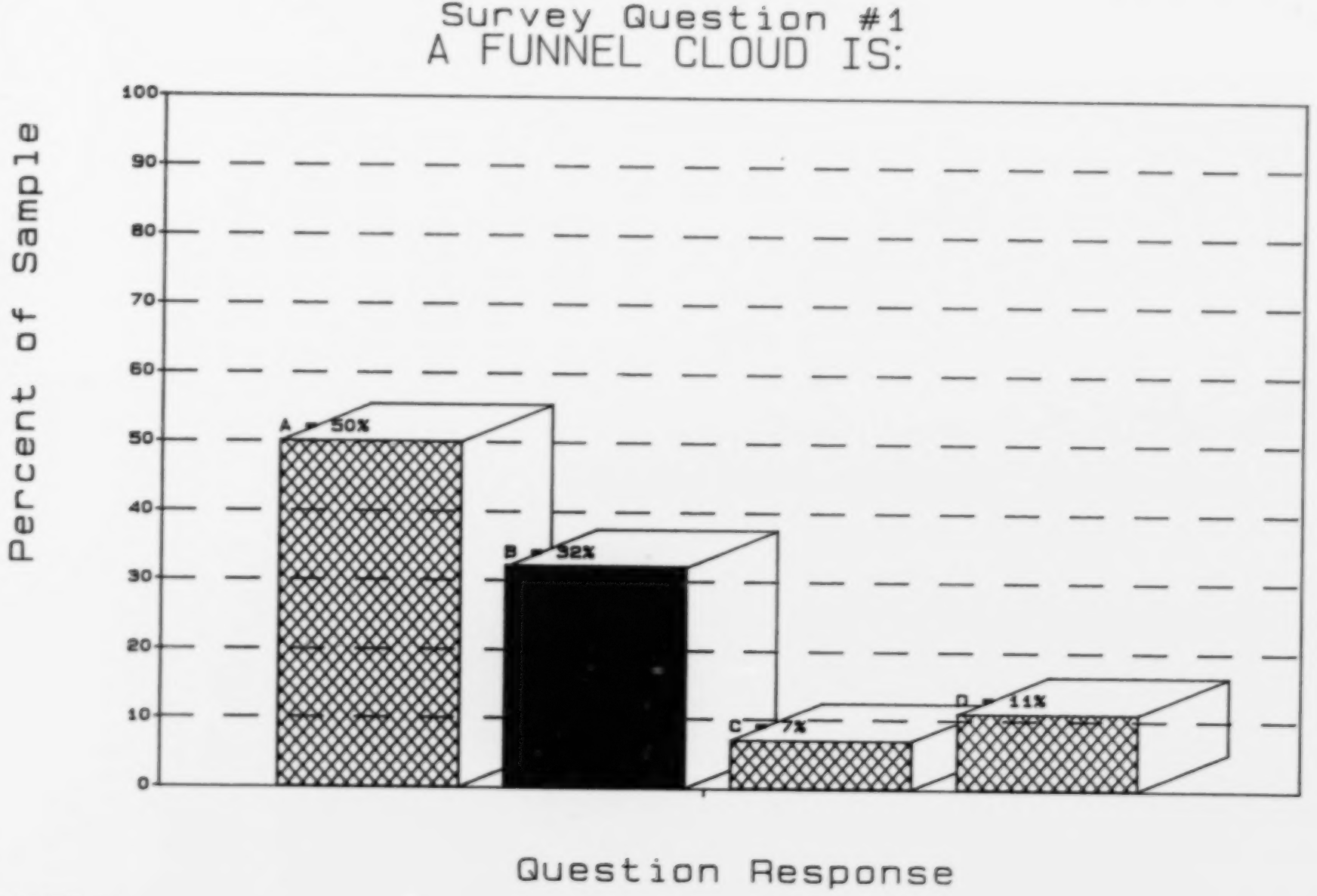

Survey Question #1
A FUNNEL CLOUD IS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 50%
B = 32%
C = 7%
D = 11%
Question Response

FIGURE 1

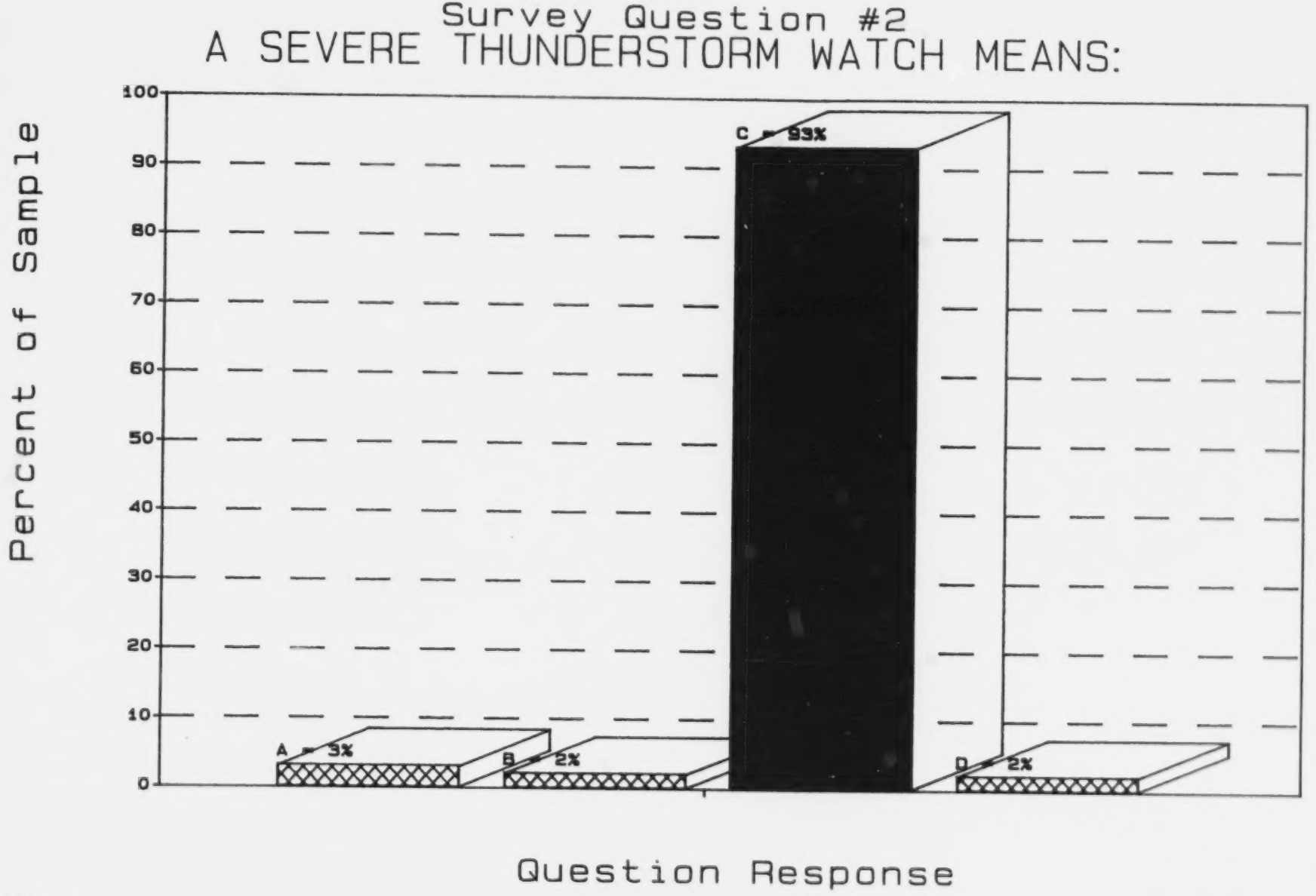

Survey Question #2
A SEVERE THUNDERSTORM WATCH MEANS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A - 3%
B - 2%
C - 93%
D - 2%
Question Response

FIGURE 2

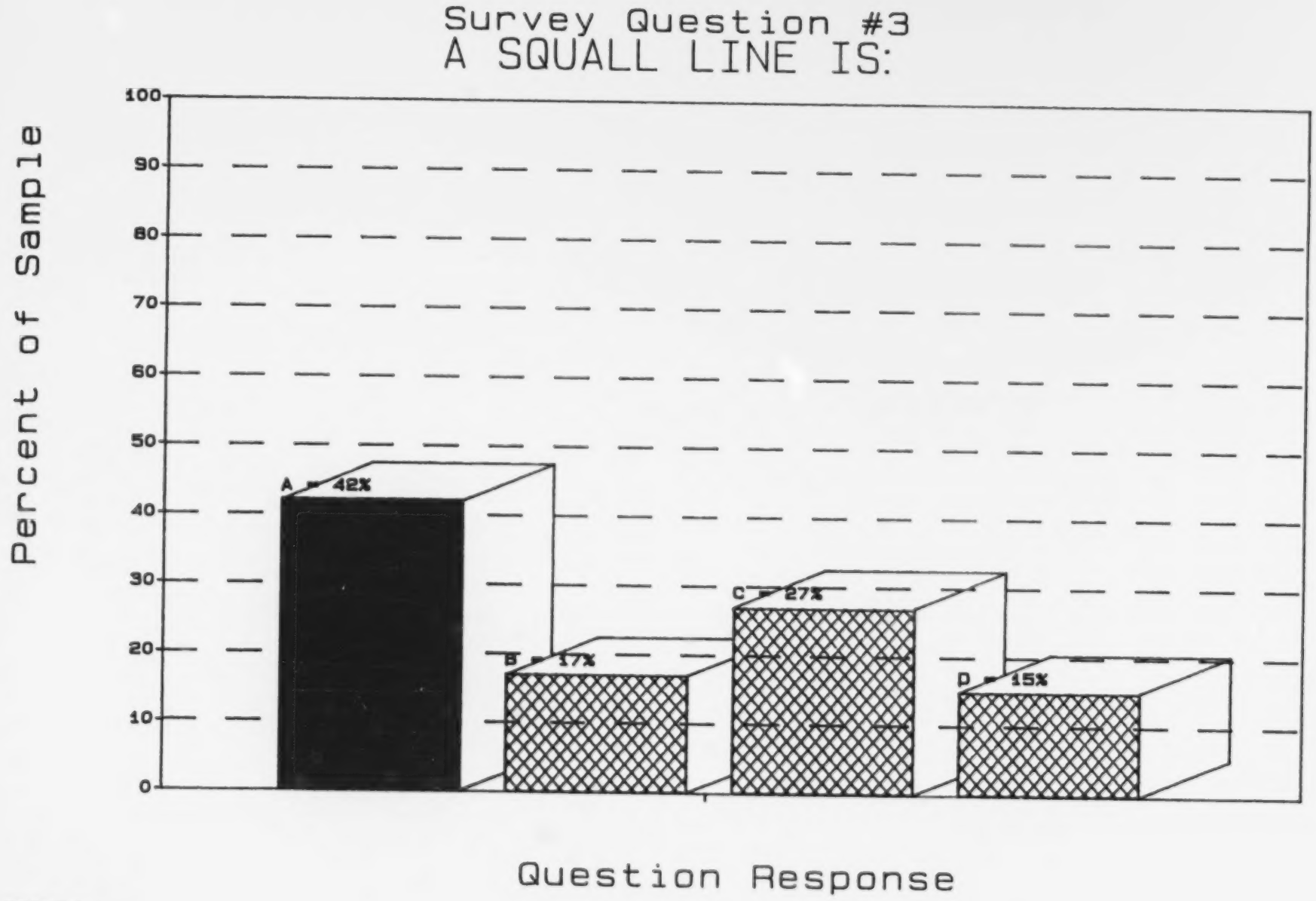

Survey Question #3
A SQUALL LINE IS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 42%
B = 17%
C = 27%
D = 15%
Question Response

FIGURE 3

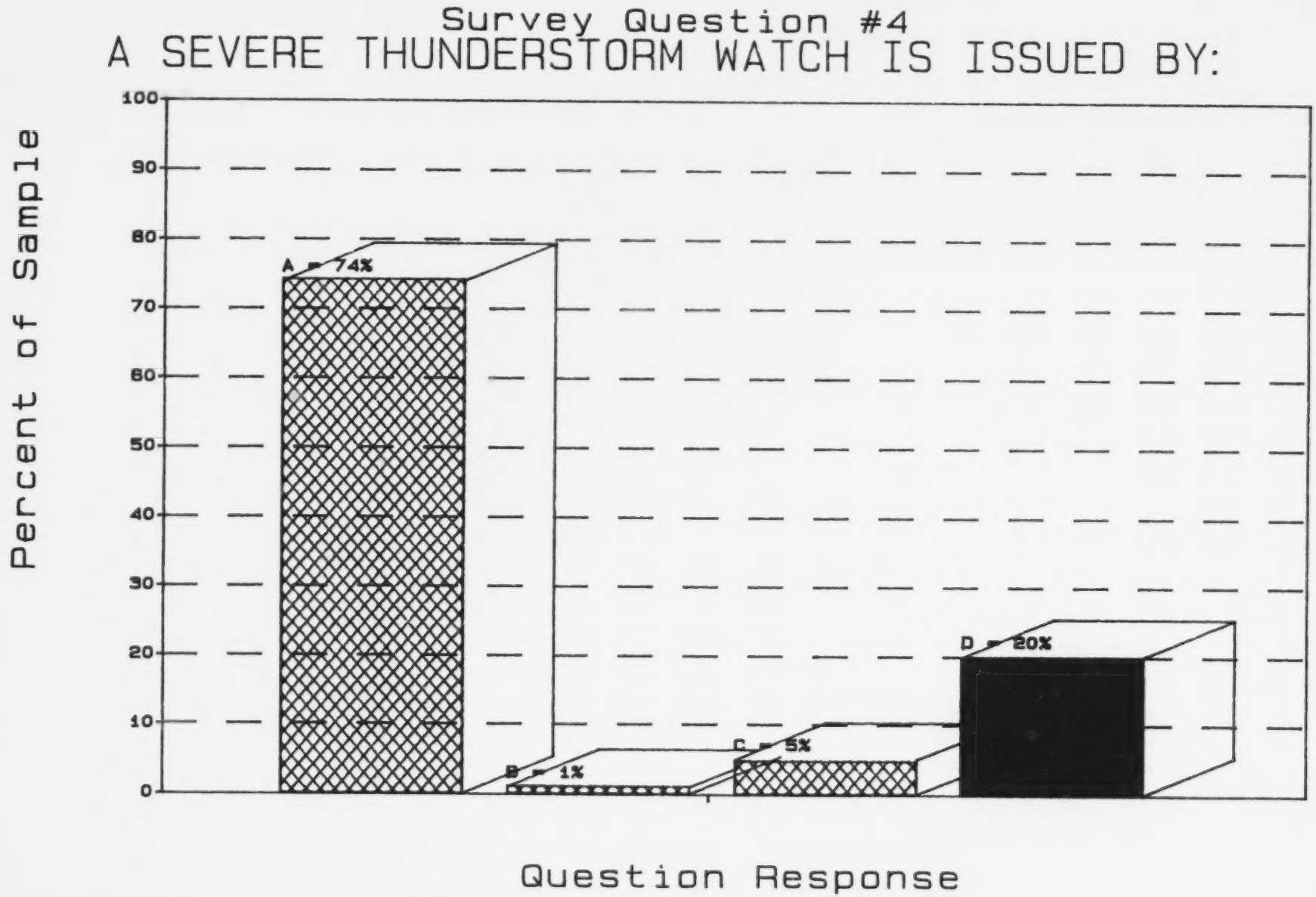

Survey Question #4
A SEVERE THUNDERSTORM WATCH IS ISSUED BY:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 74%
B = 1%
C = 5%
D = 20%
Question Response

FIGURE 4

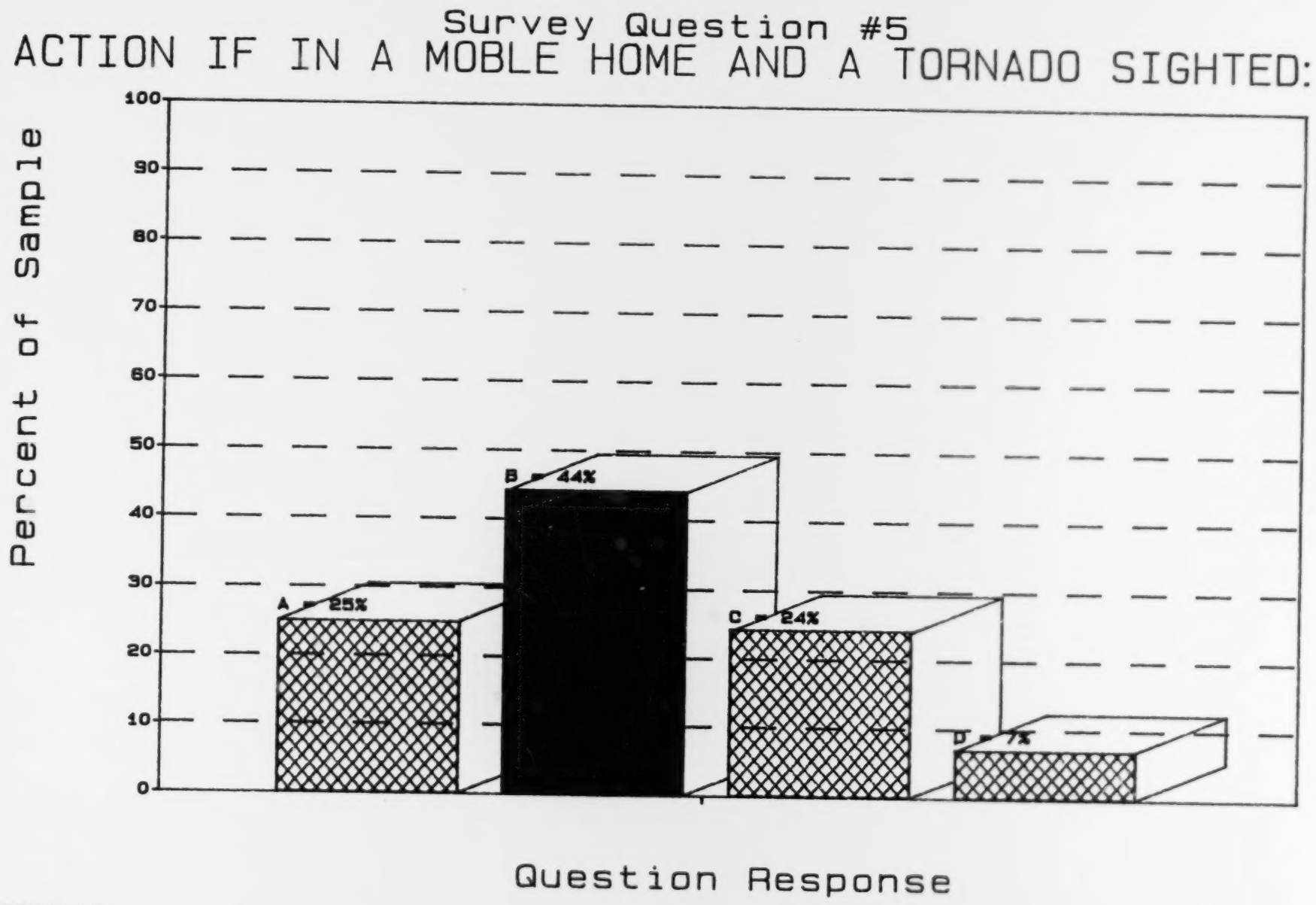

Survey Question #5
ACTION IF IN A MOBLE HOME AND A TORNADO SIGHTED:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 25%
B = 44%
C = 24%
D = 7%
Question Response

FIGURE 5

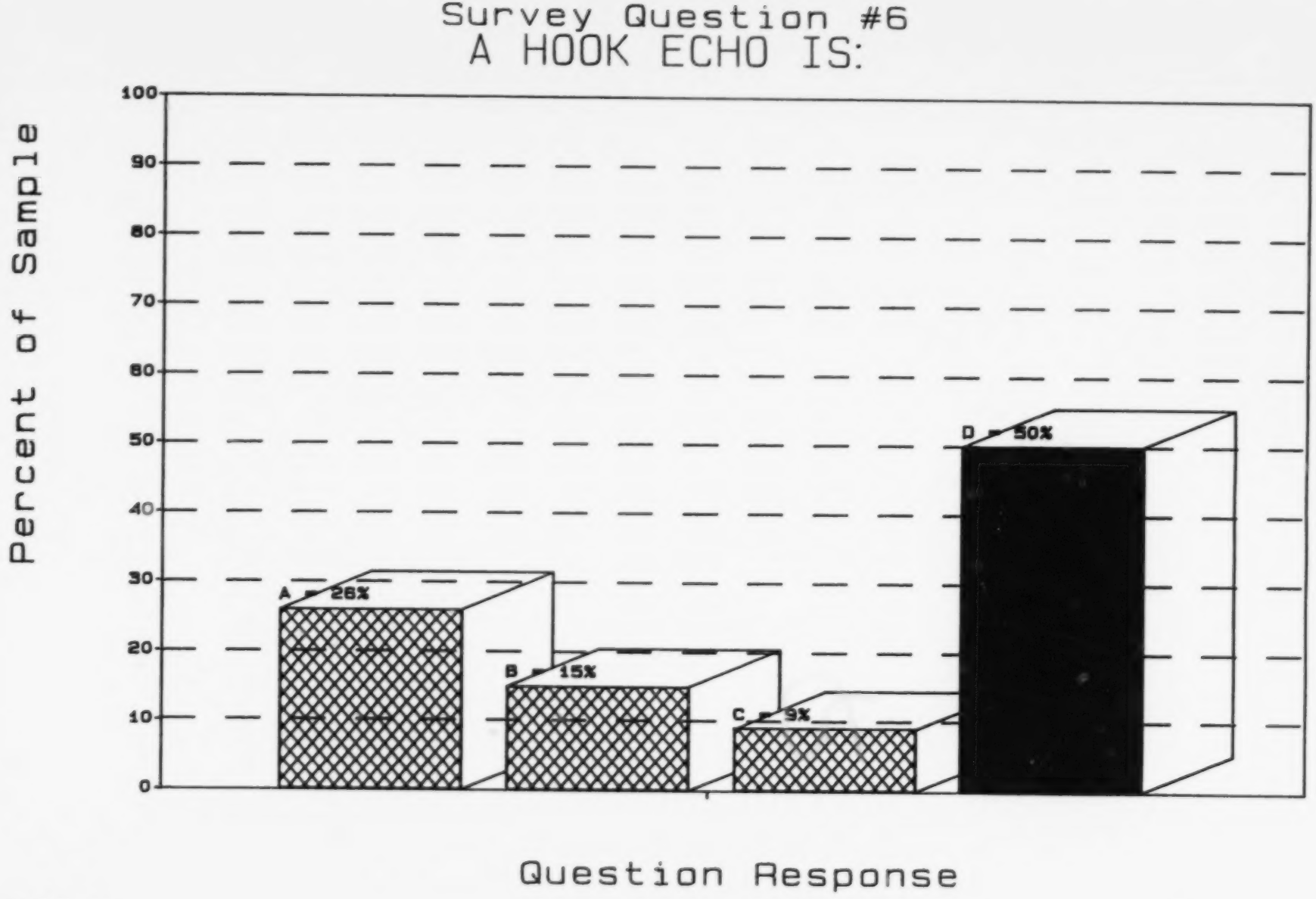

Survey Question #6
A HOOK ECHO IS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 26%
B = 15%
C = 9%
D = 50%
Question Response

FIGURE 6

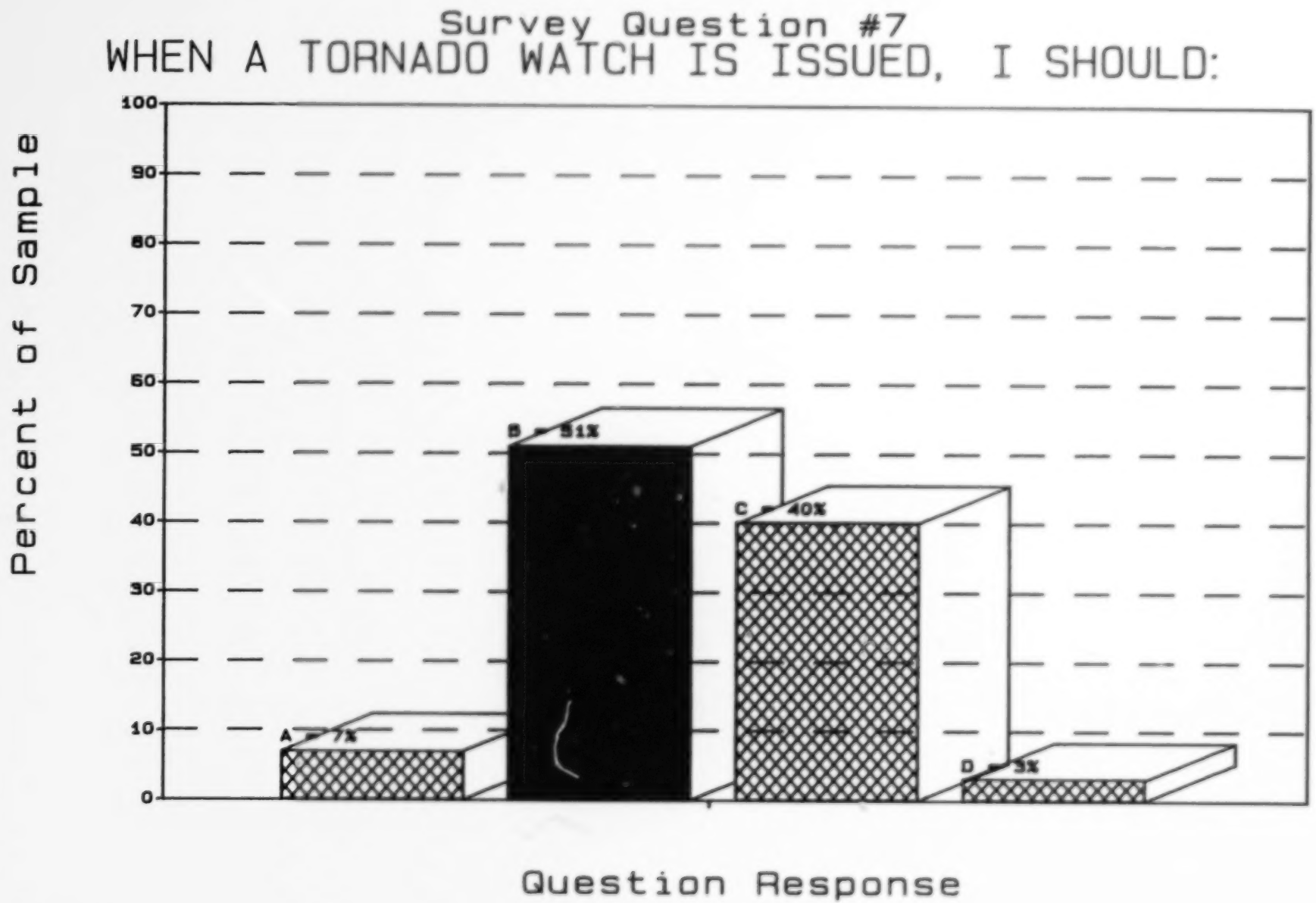

Survey Question #7
WHEN A TORNADO WATCH IS ISSUED, I SHOULD:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 7%
B = 51%
C = 40%
D = 3%
Question Response

FIGURE 7

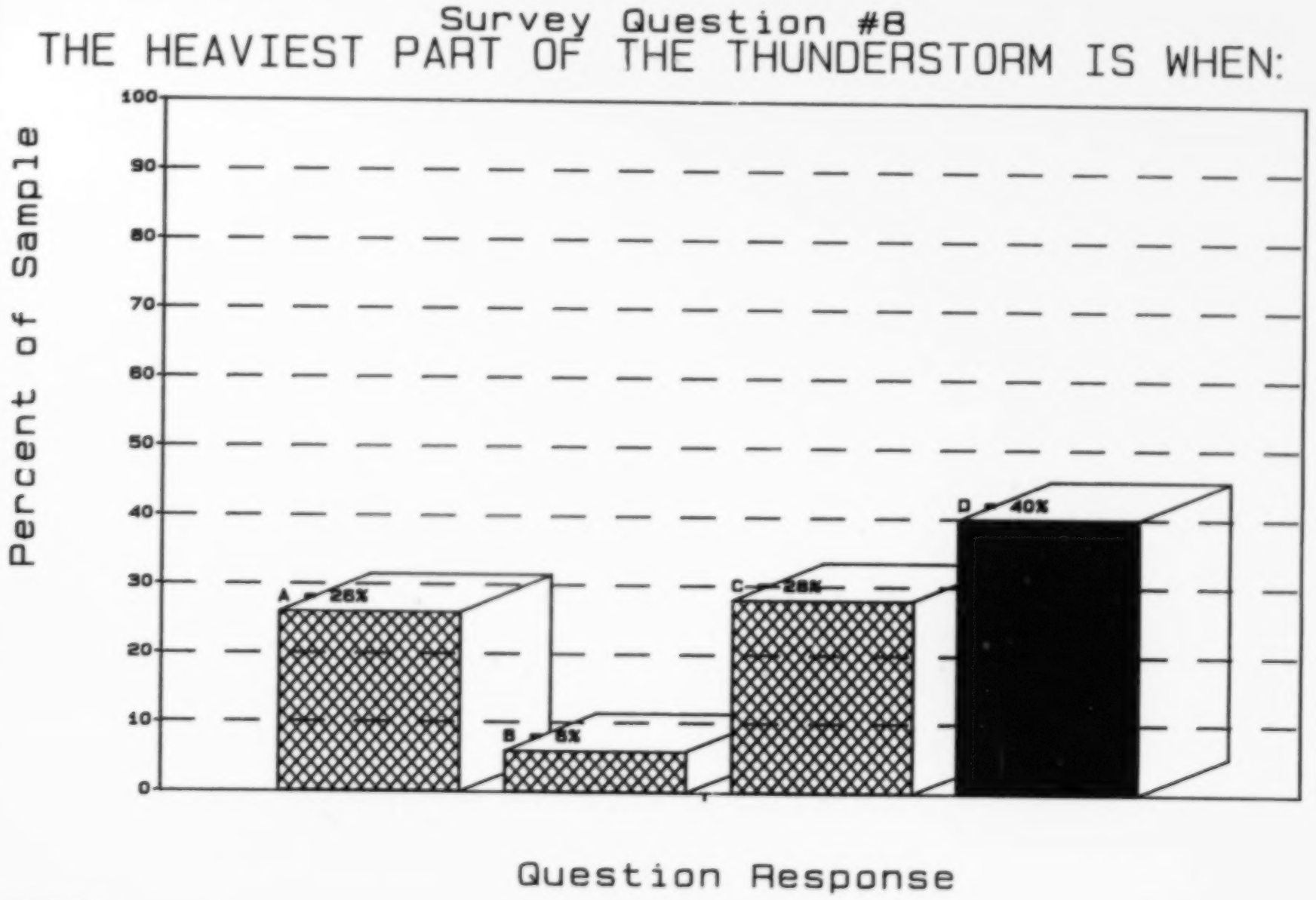

Survey Question #8
THE HEAVIEST PART OF THE THUNDERSTORM IS WHEN:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 26%
B = 6%
C = 28%
D = 40%
Question Response

FIGURE 8

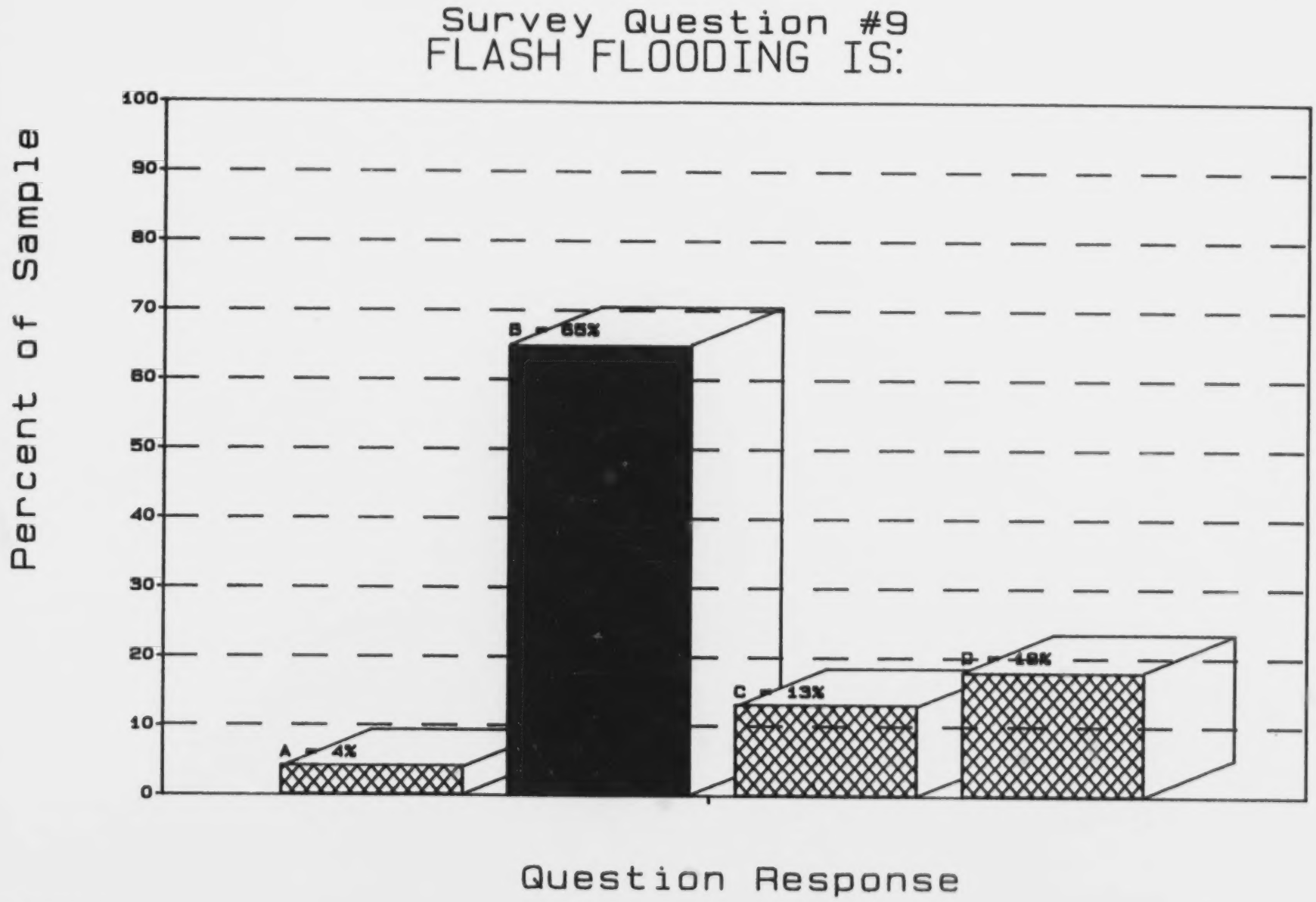

Survey Question #9
FLASH FLOODING IS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 4%
B = 65%
C = 13%
D = 18%
Question Response

FIGURE 9

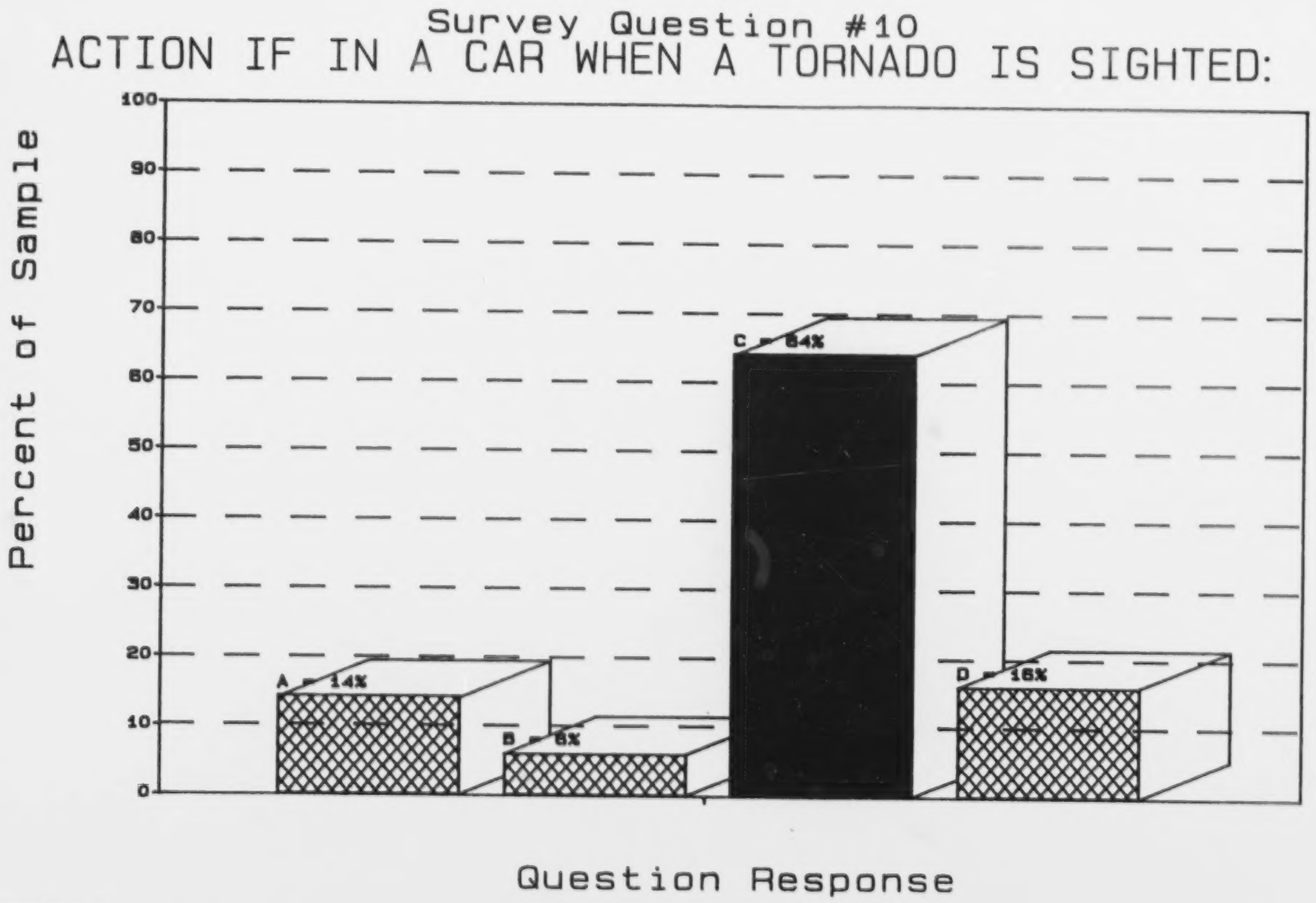

Survey Question #10
ACTION IF IN A CAR WHEN A TORNADO IS SIGHTED:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 14%
B = 6%
C = 64%
D = 16%
Question Response

FIGURE 10

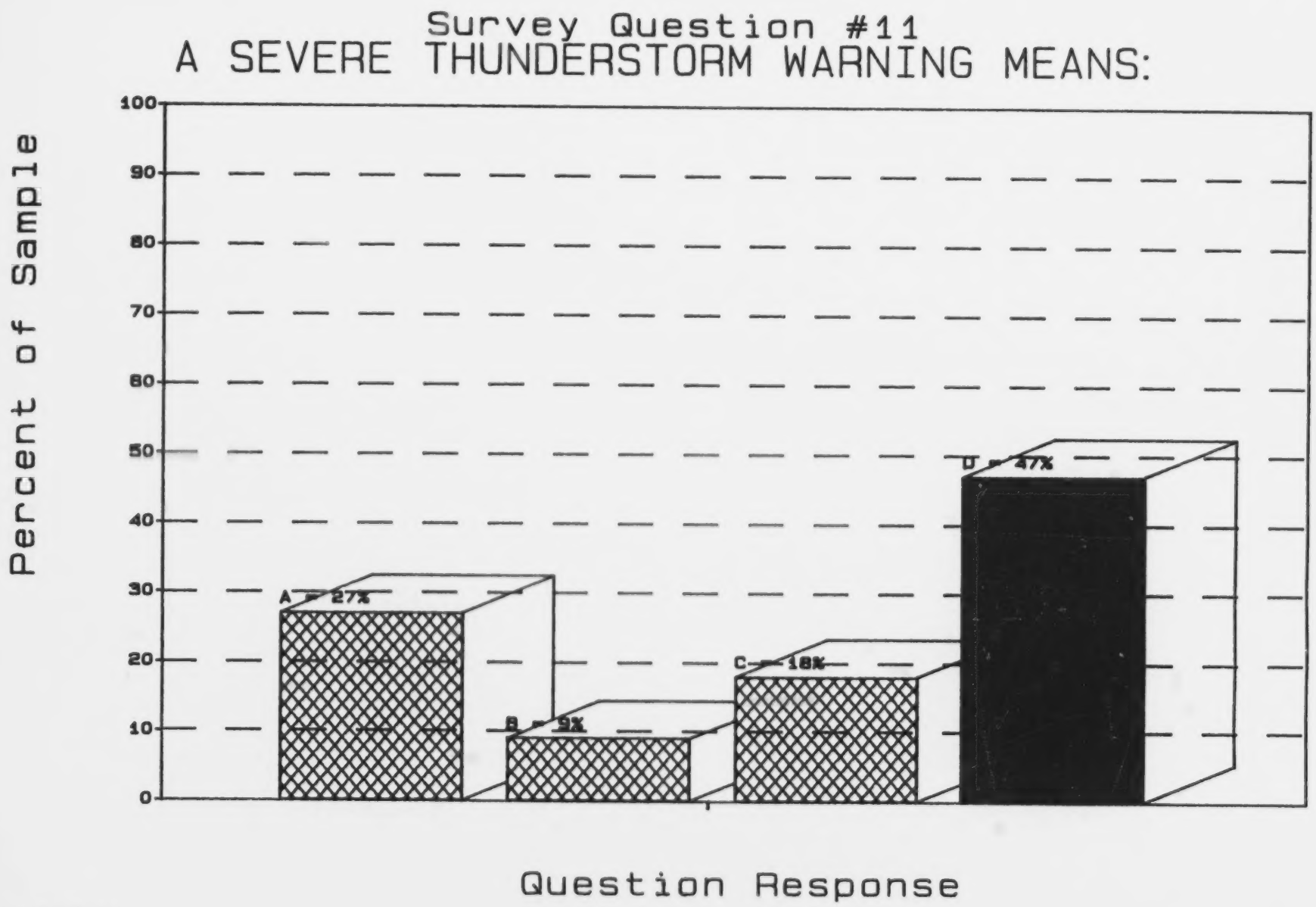

Survey Question #11
A SEVERE THUNDERSTORM WARNING MEANS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 27%
B = 9%
C = 18%
D = 47%
Question Response

FIGURE 11

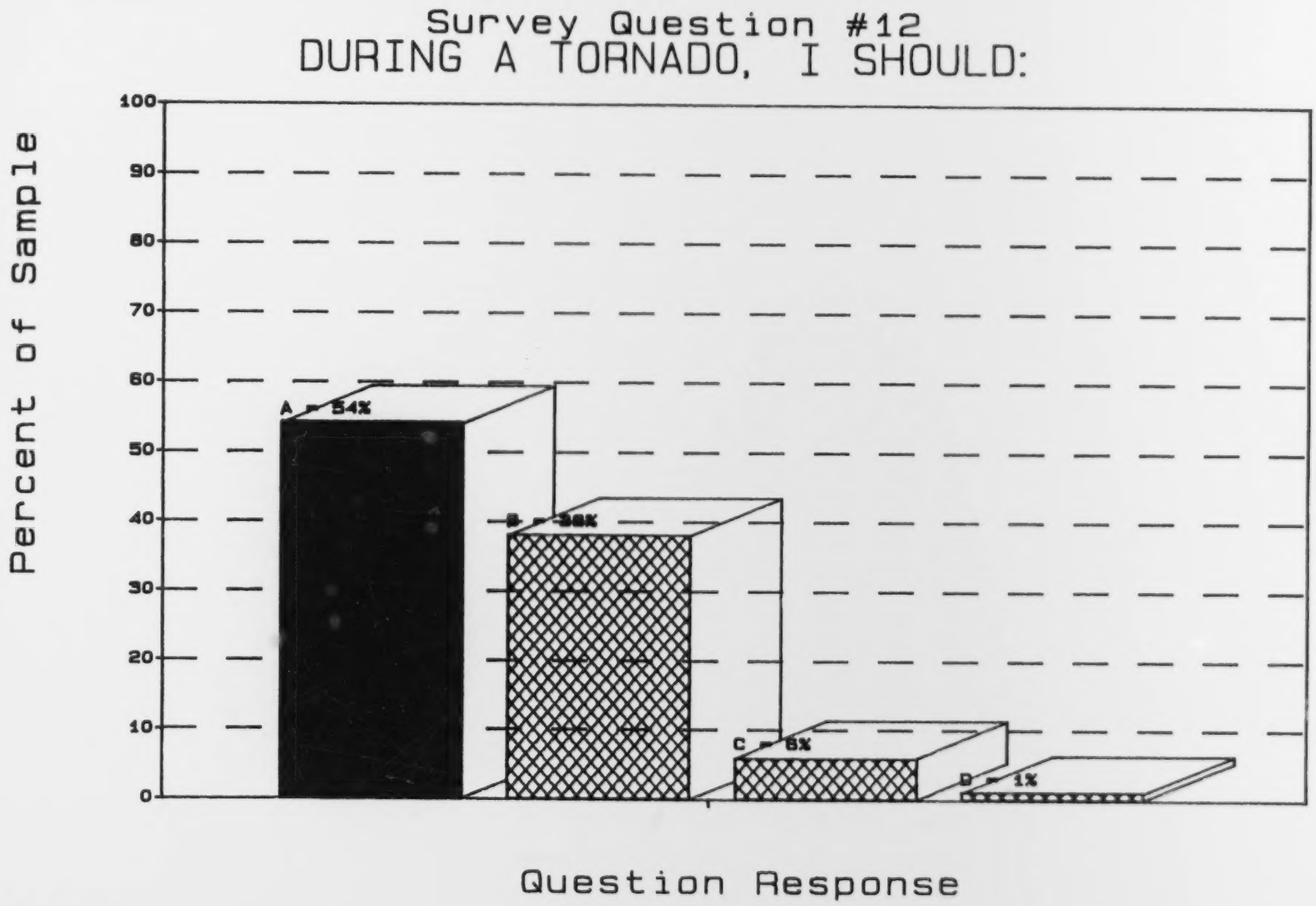

Survey Question #12
DURING A TORNADO, I SHOULD:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A - 54%
B - 38%
C - 6%
D - 1%
Question Response

FIGURE 12

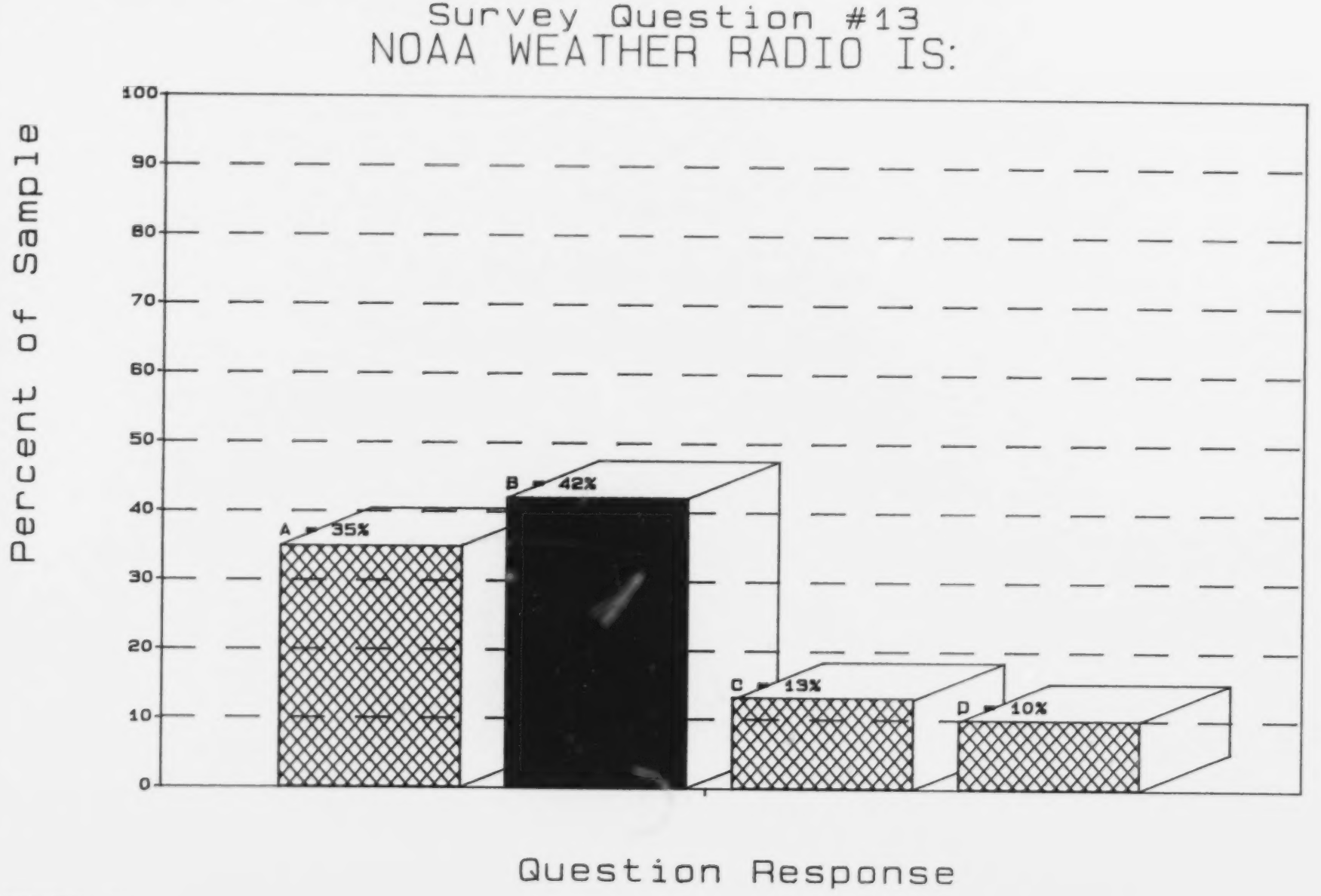

Survey Question #13
NOAA WEATHER RADIO IS:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 35%
B = 42%
C = 13%
D = 10%
Question Response

FIGURE 13

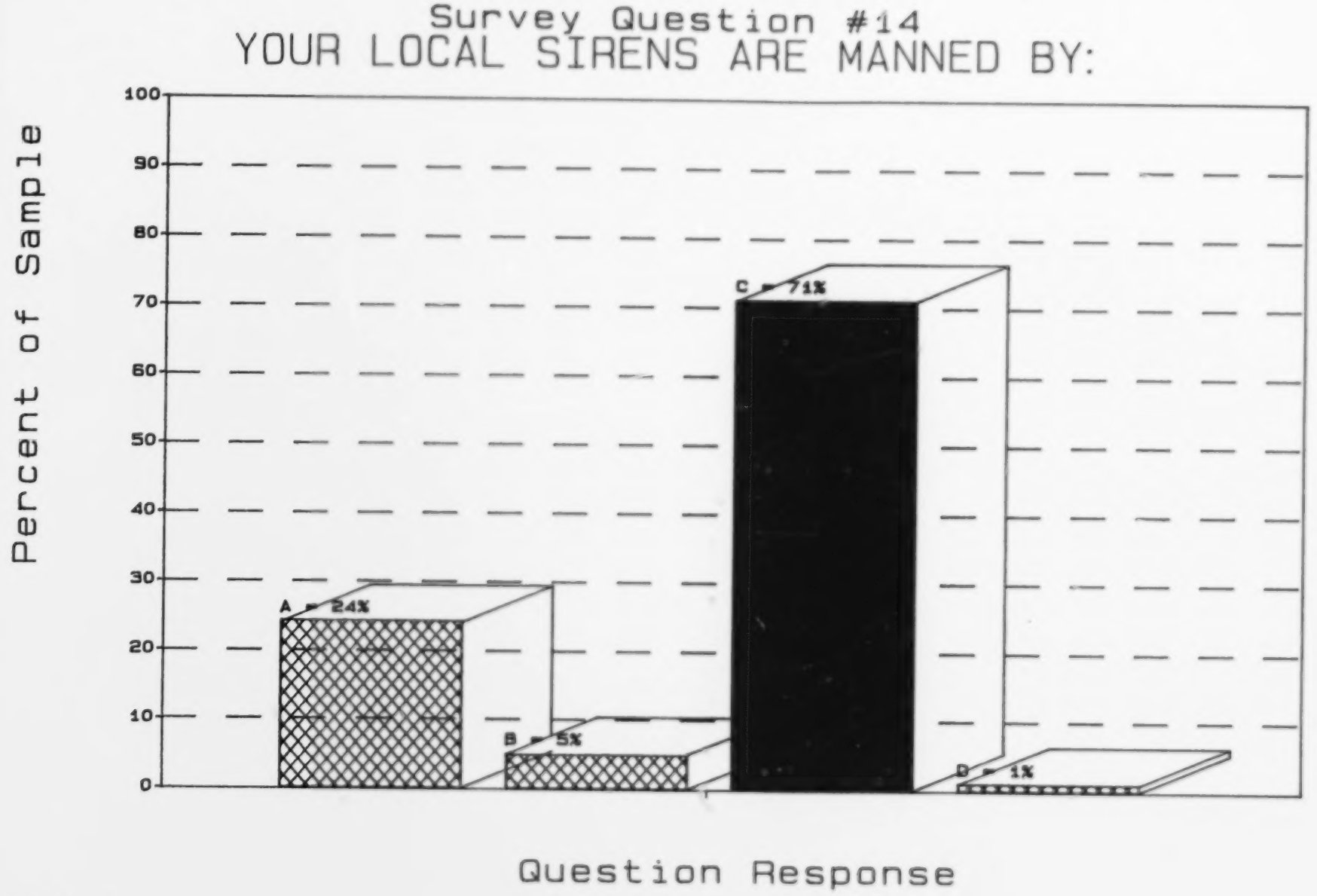
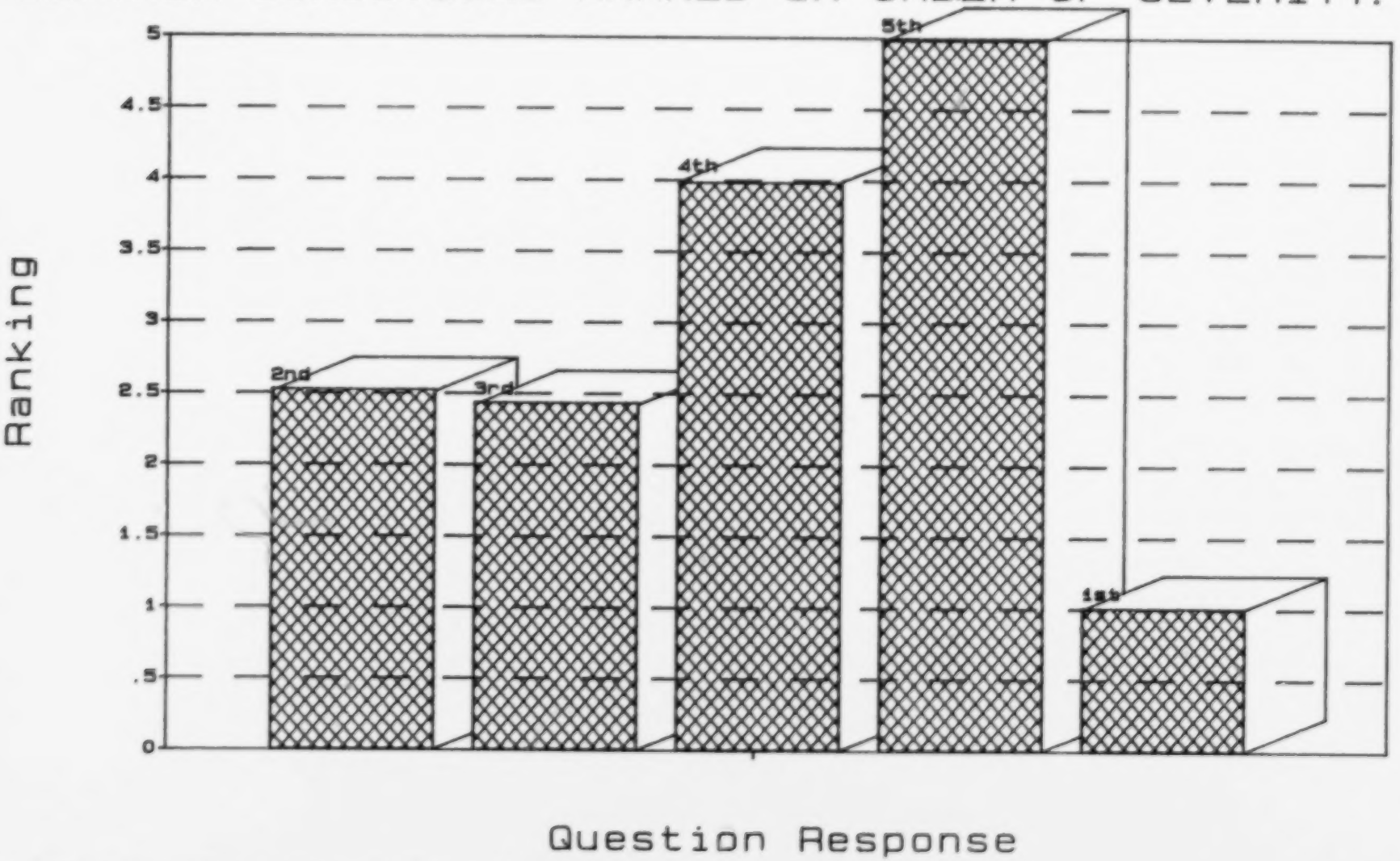

Survey Question #14
YOUR LOCAL SIRENS ARE MANNED BY:
Percent of Sample
100
90
80
70
60
50
40
30
20
10
0
A = 24%
B = 5%
C = 71%
D = 1%
Question Response

FIGURE 14

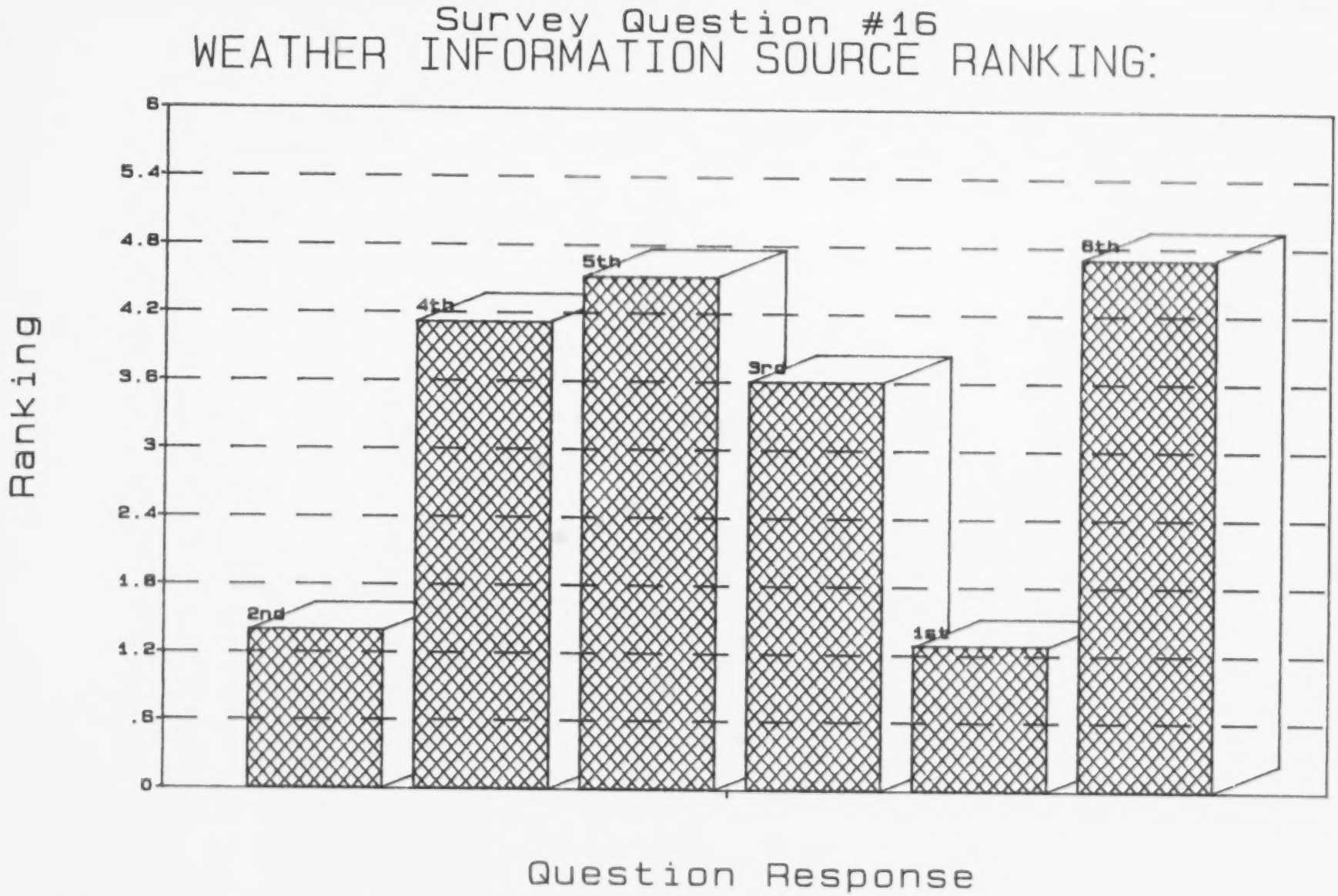
Survey Question #15

WEATHER CONDITIONS RANKED IN ORDER OF SEVERITY:



1 Indicates Most Severe 5 Indicates Least Severe

FIGURE 15



1 Indicates Most Used 6 Indicates Least Used
FIGURE 16